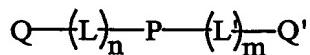


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THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:-

1. A cross-linked pair of polymerisable monomer units having the structure:



wherein Q and Q' are polymerisable units

5 L and L' are linkers providing direct or indirect electronic communication between P and Q and Q'

P is an electrofunctional unit

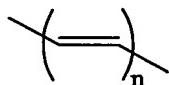
wherein n = 0, 1, 2 or 3

wherein m = 0, 1, 2 or 3

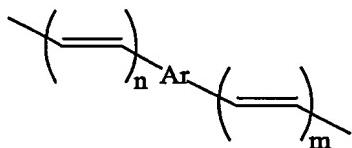
- 10 2. A cross-linked pair of polymerisable monomer units according to claim 1 wherein Q and Q' are substituted aromatic rings or heteroaromatic rings selected from the group comprising:

substituted aromatic, aniline, substituted aniline, thiophene, substituted thiophene, oligothiophene, furan, substituted furan, pyrrole and substituted pyrrole.

- 15 3. A cross-linked pair of polymerisable monomer units according to claim 1 or claim 2 wherein L and L' are selected from the group comprising:



and



20 wherein n = 0, 1, 2 or 3

wherein m = 0, 1, 2 or 3

and Ar is selected from the group comprising phenyl, naphthyl, polyaryl, heteroaryl, and ferrocenyl or similar metal sandwich complex.

- 25 4. A cross-linked pair of polymerisable monomer units according to any one of the preceding claims where P is selected from the group comprising:

porphyrin

substituted porphyrin

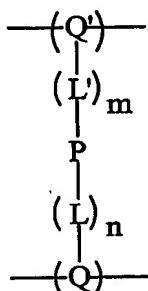
phthalocyanine

substituted phthalocyanine

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tetranitrogen-containing macrocycle

5. A cross-linked pair of polymerisable monomer units according to any one of claims 1 to 4 wherein Q and Q' are of molecular dimensions sufficient to permit polymerisation of the monomer units of the cross-linked pair of polymerisable monomer units as a homopolymer.
6. An electrofunctional unit cross-linked polymer comprising the structure:



where Q and Q' are monomer units of the polymer

L and L' are linkers providing direct or indirect electronic communication between

10 Q and P and between P and Q'

P is an electrofunctional unit

wherein n = 0, 1, 2 or 3

wherein m = 0, 1, 2 or 3

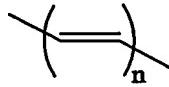
7. An electrofunctional unit cross-linked polymer according to claim 6 wherein Q and

15 Q' are substituted aromatic rings or heteroaromatic rings selected from the group comprising:

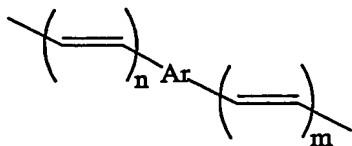
substituted aromatic, aniline, substituted aniline, thiophene, substituted thiophene, oligothiophene, furan, substituted furan, pyrrole and substituted pyrrole.

8. An electrofunctional unit cross-linked polymer according to claims 6 or claim 7

20 wherein L is selected from the group comprising:



and



wherein n = 0, 1, 2 or 3

25 wherein m = 0, 1, 2 or 3

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and Ar is selected from the group comprising phenyl, naphthyl, polyaryl, heteroaryl, and ferrocenyl or similar metal sandwich complex.

9. An electrofunctional unit cross-linked polymer according to any one of claims 6 to 8 wherein P is selected from the group comprising:

5 porphyrin

substituted porphyrin

phthalocyanine

substituted phthalocyanine

tetranitrogen-containing macrocycle

- 10 10. An electrofunctional unit cross-linked polymer according to any one of claims 6 to 9 wherein the polymer is a copolymer of the monomer units Q and Q' and at least one other monomer unit.

11. An electrofunctional unit cross-linked polymer according to claim 10 wherein the other monomer unit is a substituted aromatic or heteroaromatic ring.

- 15 12. An electrofunctional unit cross-linked polymer according to claim 11 wherein the other monomer unit is selected from the group comprising:
substituted aromatic, aniline, substituted aniline, thiophene, substituted thiophene, oligothiophene, furan, substituted furan, pyrrole and substituted pyrrole.

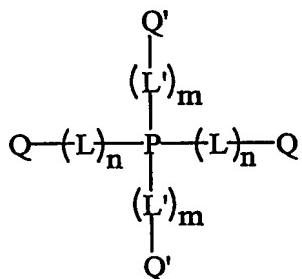
13. An electrofunctional unit cross-linked polymer according to claim 12 wherein the other monomer unit is terphiphene.

- 20 14. An electrofunctional unit cross-linked polymer according to any one of claims 6 to 13 wherein the electrofunctional unit is coordinated with metal.

15. An electrofunctional unit cross-linked polymer according to claim 14 wherein the metal is zinc.

- 25 16. An electrofunctional unit cross-linked polymer according to any one of claims 6 to 15 wherein the polymer has been prepared by electropolymerisation.

17. A cross-linked quartet of polymerisable monomer units having the structure:



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wherein:

Q and **Q'** are the polymerisable monomer units

L and **L'** are linkers providing direct or indirect electronic communication between

P and **Q** and **Q'**

5 **P** is an electrofunctional unit

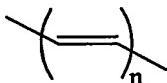
n = 0, 1, 2 or 3

m = 0, 1, 2 or 3

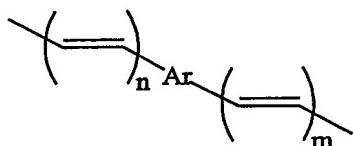
18. A cross-linked quartet of polymerisable monomer units according to claim 17
wherein **Q** and **Q'** are substituted aromatic rings or heteroaromatic rings selected
10 from the group comprising:

substituted aromatic, aniline, substituted aniline, thiophene, substituted thiophene,
oligothiophene, furan, substituted furan, pyrrole and substituted pyrrole.

19. A cross-linked quartet of polymerisable monomer units according to claim 17 or
claim 18 wherein **L** is selected from the group comprising:



15 and



20 wherein **n** = 0, 1, 2 or 3

wherein **m** = 0, 1, 2 or 3

and **Ar** is selected from the group comprising phenyl, naphthyl, polyaryl, heteroaryl,
25 and ferrocenyl or similar metal sandwich complex.

20. A cross-linked quartet of polymerisable monomer units according to claim 17 or
claim 18 where **P** is selected from the group comprising:

porphyrin

25 substituted porphyrin

phthalocyanine

substituted phthalocyanine

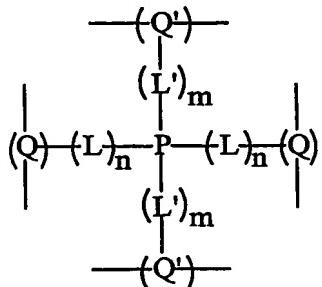
tetrannitrogen-containing macrocycle

21. A cross-linked quartet of polymerisable monomer units according to any one of
30 claims 17 to 20 wherein **Q** and **Q'** are of molecular dimensions sufficient to permit

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polymerisation of the monomer units of the cross-linked quartet of polymerisable monomer units as a homopolymer.

22. An electrofunctional unit cross-linked polymer comprising the structure:



where Q and Q' are monomer units of the polymer

L and L' are linkers providing direct or indirect electronic communication between Q and P and between P and Q'

P is the electrofunctional unit

wherein n = 0, 1, 2 or 3

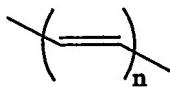
10 wherein m = 0, 1, 2 or 3

23. An electrofunctional unit cross-linked polymer according to claim 22 wherein Q and Q' are substituted aromatic rings or heteroaromatic rings selected from the group comprising:

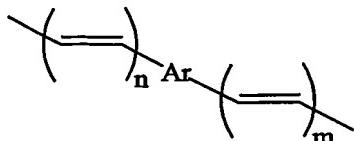
substituted aromatic, aniline, substituted aniline, thiophene, substituted thiophene, oligothiophene, furan, substituted furan, pyrrole and substituted pyrrole.

- 15 oligothiophene, furan, substituted furan, pyrrole and substituted pyrrole.

24. An electrofunctional unit cross-linked polymer according to claims 22 or claim 23 wherein L is selected from the group comprising:



and



20

wherein $n = 0, 1, 2$ or 3

wherein $m = 0, 1, 2$ or 3

and Ar is selected from the group comprising phenyl, naphthyl, polyaryl, heteroaryl, and ferrocenyl or similar metal sandwich complex.

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25. An electrofunctional unit cross-linked polymer according to any one of claims 22 to 23 wherein P is selected from the group comprising:
 - porphyrin
 - substituted porphyrin
- 5 phthalocyanine
 - substituted phthalocyanine
 - tetranitrogen-containing macrocycle
- 10 26. An electrofunctional unit cross-linked polymer according to any one of claims 22 to 25 wherein the polymer is a copolymer of the monomer units Q and Q' and at least one other monomer unit.
27. An electrofunctional unit cross-linked polymer according to claim 26 wherein the other monomer unit is a substituted aromatic or heteroaromatic ring.
- 15 28. An electrofunctional unit cross-linked polymer according to claim 27 wherein the other monomer unit is selected from the group comprising:
 - substituted aromatic, aniline, substituted aniline, thiophene, substituted thiophene, oligothiophene, furan, substituted furan, pyrrole and substituted pyrrole.
29. An electrofunctional unit cross-linked polymer according to claim 28 wherein the other monomer unit is terphiophene.
30. An electrofuncation unit cross-linked polymer according to any one of claims 26 to 29 wherein the ratio of P to the at least one other monomer unit is 1:2.
- 20 31. An electrofunctional unit cross-linked polymer according to any one of claims 22 to 30 wherein the electrofunctional unit is coordinated with metal.
32. An electrofunctional unit cross-linked polymer according to claim 31 wherein the metal is zinc.
- 25 33. An electrofunctional unit cross-linked polymer according to any one of claims 22 to 32 wherein the polymer has been prepared by electropolymerisation.
34. A cross-linked pair of monomer units, cross-linked quartet of monomer units, polymer, or copolymer according to any one of the preceding claims further including a solubilising group.
- 30 35. A cross-linked pair of monomer units, cross-linked quartet of monomer units, polymer, or copolymer according to claim 34 wherein the solubilising group includes a SO_3^- moiety.

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36. An electrofunctional material including a base material and an electrofunctional unit cross-linked polymer according to any one of claims 6 to 16 or 22 to 33.
37. An electrofunctional material including a base material and a copolymer according to any one of claims 10 to 16 or 26 to 33.
- 5 38. A method of preparing an electrofunctional material comprising the steps of treating a base material with a cross-linked pair or quartet of polymerisable monomer units according to any one of claims 1 to 5 or 17 to 21 and subsequently polymerising the cross-linked pair or quartet of polymerisable monomer units.
- 10 39. A method of preparing an electrofunctional material according to claim 38 respectively, further including the step of adding at least one other monomer unit prior to polymerising.
40. A method according to claim 39 wherein the at least one other monomer unit is selected from the group comprising: substituted aromatic, aniline, substituted aniline, thiophene, substituted thiophene, oligothiophene, furan, substituted furan, 15 pyrrole and substituted pyrrole.
41. An electrofunctional material according to claim 36 or claim 37 wherein the base material is textile, glass or metal.
42. A method according to any one of claims 38 to 40 wherein the base material is textile, glass or metal.
- 20 43. A method according to any one of claims 38 to 40 wherein the polymerising is by chemical or electrochemical oxidation.
44. Method of light harvesting comprising the steps of applying a polymer or copolymer according to any one of claims 6 to 16 or 22 to 33 to a surface, applying light to the resultant surface, or exposing said surface to light, and capturing the 25 resultant current.
45. Method of light harvesting comprising the steps of applying one or more components selected from the group comprising a cross-linked pair or quartet of polymerisable monomer units according to any one of claims 1 to 5 or 17 to 21, respectively, to a surface, polymerising such units *in situ*, optionally in the presence of another monomer, polymer or copolymer, applying light to the resultant surface, or exposing said surface to light, and capturing the resultant current.
- 30 46. A method according to claim 44 or claim 45, wherein the another monomer is selected from the group consisting of benzene, substituted benzene, aniline,

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substituted aniline, thiophene, substituted thiophene, oligothiophene, furan, substituted furan, pyrrole and substituted pyrrole.

47. A photovoltaic device incorporating a polymer according to any one of claims 6 to 16 or 22 to 33.
- 5 48. A cross-linked pair of polymerisable monomer units, substantially as herein described with reference to any one of the Examples.
- 49 An electrofunctional unit cross-linked polymer, substantially as herein described with reference to any one of the Examples.
50. A cross-linked quartet of polymerisable monomer units, substantially as herein described with reference to any one of the Examples.
- 10 51. An electrofunctional material including a base material and an electrofunctional unit cross-linked polymer, substantially as herein described with reference to any one of the Examples.
52. A method of preparing an electrofunctional material, substantially as herein described with reference to any one of the Examples.
- 15 53. Method of light harvesting, substantially as herein described with reference to any one of the Examples.
54. A photovoltaic device, substantially as herein described with reference to any one of the Examples.